Phytoplankton communities in the San Francisco Estuary: monitoring and management using a submersible spectrofluorometer

Anke Mueller−Solger

Final Selection Panel Review

Proposal Title

#0332: Phytoplankton communities in the San Francisco Estuary: monitoring and management using a submersible spectrofluorometer

Funding:

Fund
Amount: **$159,160**

The final Selection Panel concurred with its initial findings on this proposal and recommended funding the proposal at the full amount requested.

Public Comments

No public comments were received for this proposal.

Initial Selection Panel Review

Proposal Title

#0332: Phytoplankton communities in the San Francisco Estuary: monitoring and management using a submersible spectrofluorometer

Funding:

Fund
Amount: **$159,160**

Initial Selection Panel (Primary) Review

Topic Areas

- Environmental Influences On Key Species And Ecosystems
- Relative Stresses On Key Fish Species
- Direct And Indirect Effects Of Diversions On At−risk Species
- Processes Controlling Delta Water Quality
- Implications Of Future Change On Regional Hydrology, Water Operations, And Environmental Processes
- Assessment And Monitoring
- Delta Smelt−related Projects

Please describe the relevance and strategic importance of this proposal in the context of this PSP. How does the proposal address the topic areas identified above? What are the broader CALFED Goals this proposal may meet that are not accounted for in these specific topic areas?

The goal of this research is to acquire and test a new and promising instrument for phytoplankton monitoring and research. If successful, the instrument will significantly improve Calfed's adaptive management capabilities in all aspects of the program in which phytoplankton play a role (and there are many). These include: harmful algal bloom detection; early warning for algal−caused taste and odor problems in the water supply; clogging of filters in water treatment facilities; food web implications of declining primary

productivity including effects on key species such as Delta smelt; and incorporation of contaminants such as selenium and mercury in estuarine food webs. All of these are in some way related to the taxonomic composition of phytoplankton, which is currently determined with a time−consuming and laborious process that does not provide data in a time frame useful to management or a manner in which temporal and spatial variability in the San Francisco Estuary can be adequately studied. This new instrument has the potential to provide these data in a time frame relevant to management decisions. It also has the potential to enable scientific evaluation of temporal and spatial variability of estuarine phytoplankton populations that can be linked to hydrodynamic modeling efforts. Although the instrument appears very promising, the research described in this proposal is essential for determining if that promise is achievable in the San Francisco Estuary. At first glance it seems unlikely that one proposal could address as many of the Calfed strategic goals as have been checked off above. However, because of the centrality of phytoplankton to the issues identified, the proposed research does address all of the strategic goals indicated. It also directly responds to one of the research needs identified in the EMP review, namely development of instruments that will enable the development of more effective continuous and real−time monitoring programs.

The budgets of proposals submitted in response to this PSP are larger, on average, than those submitted to CALFED in previous years. The Science Program is committed to getting as much science per dollar as is reasonably possible. With this commitment in mind, can the proposed budget be streamlined? If so, please recommend and clearly justify a new budget total in the space provided.

This is an exceptionally cost−effective proposal. Salaries are largely paid by the collaborating institutions, and the field work will be done as part of on−going monitoring programs with which the proposed research is well integrated. The team is highly experienced with an excellent track record in both science and coordination of a research team.

Evaluation Summary And Rating.

Provide a brief explanation of your summary rating and any additional comments you feel are pertinent.

This is a cost−effective proposal that addresses multiple strategic goals.

Selection Panel (Discussion) Review

fund this amount: $**159,160**
note:
fund

This project proposes to test a new instrument for real−time monitoring of phytoplankton communities in the San Francisco Estuary. If this is successful, the instrument would significantly improve CALFED's capabilities in all aspects of the program in which phytoplankton play a role; these range broadly.

The instrument has been used in other aquatic environments, but interactions with DOM, sediments, etc. make it uncertain whether it will work for continuous monitoring in this system (fouling, etc.). This is not a brand−new instrument. It's being used in a number of places around the world. This is not cutting−edge science. Rather, it is an application of an existing methodology in the San Francisco Estuary. One suggestion was to get the manufacturer to loan the instrument to demonstrate it's effectiveness.

The Panel was very divided on this, with panel members raising a number of concerns, most of them countered by other panel members with opposite opinions. They did not see this proposal as science per se. "Buy an instrument, see if it works" may not be transformative for CALFED. Also, this instrument will likely be tried whether or not Science Program PSP funding is used for it; however it's likely that this funding would determine whether it would ultimately be put in place. Also, the opinion was voiced that in a lean funding year, funding

should go only to those projects that can potentially directly provide useful information for managers. The Panel was divided on whether this proposal would provide useful information for managers, and that it would have immediate payoffs if it works.

Overall, this instrument could have important impacts on how we would do monitoring in this system if the results are positive. There is a program that monitors phytoplankton on a monthly basis; the new equipment has the potential reduce costs by making a more rapid assessment, and help existing efforts. This project has the potential to result in real−time data in an area where monitoring exists, but may currently be inadequate. If so, this would be an investment in changing our philosophy about how to collect and use data, and would advance ongoing efforts.

The Panel recognized the proposal was very cost effective because staff salaries are covered by DWR and because field sampling will be done in conjunction with on−going monitoring programs. The reputation of the applicant is strong.

Panel Ranking: Fund

Collaboration Panel Review

Proposal Title

#0332: Phytoplankton communities in the San Francisco Estuary: monitoring and management using a submersible spectrofluorometer

Final Panel Rating
above average

Collaboration Panel (Primary) Review

Collaboration:

Will the results of the collaborative effort be greater than the sum of its parts? Is it clear why the subprojects are part of a larger collaborative proposal rather than several independent smaller ones?

above average
straightforward study, with field data acquision and laboratory activities closely coupled

Interdependence And Integration:

Does the proposal have an example that clearly articulates the conceptual model of each subproject and how they link together as a whole? Are the boundaries of the study plans focused and cohesive, yet well delineated? Is there a plan for potential differences in the stages of subproject completion times? Are there clear plans for analyses and interpretations which seek to identify and quantify relationships among the data collected in various subprojects rather than separate analyses for each subproject?

superior
clearly planned interdependence and integration

Project Management:

Is it clear who will be performing management tasks and administration of the project? Are there resources set aside for project management and time given for investigators to collaborate? Is there a process for making decisions during the course of the project? Are

there acknowledgments of potential barriers to collaboration and explanations of how team members will overcome barriers particular to their institutions?

superior
well planned, well written, carefully budgeted, no barriers to collaboration; the lead investigator is quite capable and experienced

Team Composition:

Does the lead principal investigator have successful management history and experience leading collaborative teams? Is it clear that all key personnel are committed to making significant contributions to the project? Do team members have complementary skills?

superior
complementary skills, knowledge, assigned tasks; lead investigator has a successful management history, and has worked extensively with collaborative teams

Communication Of Results:

Is there a clear plan for comprehensive and cohesive reporting of project progress to the CALFED community?

above average
results will reach related CALFED projects and the white literature

Additional Comments:

Collaboration Panel (Discussion) Review

Primary reviewer gave the proposal a Superior rating. The secondary reviewer agrees with primary in most categories, however, did not rate it Superior because there was little information given on recording of results. To come to a compromise, the overall summary rating given was Above

Average.

Technical Synthesis Panel Review

Proposal Title

#0332: Phytoplankton communities in the San Francisco Estuary: monitoring and management using a submersible spectrofluorometer

Final Panel Rating
above average

Technical Synthesis Panel (Primary) Review

TSP Primary Reviewer's Evaluation Summary And Rating:

The primary goal is to acquire and test the usefulness of a submersible spectrofluorometer (the bbe Fluoroprobe) for monitoring the major taxonomic groupd of phytoplankton. It will be tested in the lab with algal cultures and natural samples, and during stationary and vessel−based deployments in the field. This will be conducted simultaneously with the routine phytoplankton monitoring program, so that the two types of results can then be compared. As a secondary goal, the field data will be used to assess the spatial and temporal distribution of phytoplankton groups in the delta. This is in general a well−developed proposal on evaluating equipment that could potentially provide continuous and real−time data on phytoplankton abundance and taxonomic composition (by major groups). The described combination of laboratory and field work is very appropriate for addressing the primary goal. There are some relatively minor problems with the proposal. The aspects on spatial and temporal patterns are not well developed, and sampling is fairly limited for assessing such patterns (but this is not the main objective). While the proposal authors stress the fluoroprobe’s potential usefulness with respect to monitoring for harmful algal blooms, there is no indication that the methodology will be able to distinguish HAB algae from others. But it would be able to detect large

increases in abundance of e.g. blue−greens (several of the HAB species in the estuary are blue−greens), such that it could provide early warning of a potential problem. Another minor problem with the proposal is that it does not list specific performance criteria for the new methodology to be considered successful. This proposal is very well leveraged (salary−wise and tie−in with routine field sampling for logistics and use of data) making it a very cost−effective project.

Additional Comments:

SUMMARY OF EXTERNAL REVIEW: Goals, objectives and hypothesis were felt to be clear and internally consistent, and the topic to be timely and important. The proposal was considered to be well justified; phytoplankton community structure is at the heart of ecosystem function, and new methodologies could be very helpful in monitoring. The proposal strength was felt to be the "proof of concept" for the new methodology, while there was less justification for the assessment of temporal and spatial variability. The approach was generally considered to be valid and very appropriate, though it was not clear how the phytoplankton enumeration data would be interpreted relative to the broader classes (determined with the spectrofluorometer). The external reviewers felt that the approach was very feasible and the likelihood of success to be very high. According to one of the reviewers, the proposal inadequately distinguished between developmental work and monitoring. The project would lead to a valuable product; an assessment of the value of the Fluoroprobe for operational monitoring in the future. The project team has a proven track record,and to have access to the necessary facilities and support staff needed to carry out the project successfully. The budget was considered to be reasonable and adequate, with excellent leverage (such as the use of existing field and monitoring efforts) making the project a good value.

The primary goal is to acquire and test the usefulness of a submersible spectrofluorometer (the bbe Fluoroprobe) for monitoring the major taxonomic groupd of phytoplankton. It will be tested in the lab with algal cultures and natural

samples, and during stationary and vessel−based deployments in the field. This will be conducted simultaneously with the routine phytoplankton monitoring program, so that the two types of results can then be compared. As a secondary goal, the field data will be used to assess the spatial and temporal distribution of phytoplankton groups in the delta. This is in general a well−developed proposal on evaluating equipment that could potentially provide continuous and real−time data on phytoplankton abundance and taxonomic composition (by major groups). The described combination of laboratory and field work is very appropriate for addressing the primary goal. There are some relatively minor problems with the proposal. The aspects on spatial and temporal patterns are not well developed, and sampling is fairly limited for assessing such patterns (but this is not the main objective). While the proposal authors stress the fluoroprobe's potential usefulness with respect to monitoring for harmful algal blooms, there is no indication that the methodology will be able to distinguish HAB algae from others. But it would be able to detect large increases in abundance of e.g. blue−greens (several of the HAB species in the estuary are blue−greens), such that it could provide early warning of a potential problem. Another minor problem with the proposal is that it does not list specific performance criteria for the new methodology to be considered successful. This proposal is very well leveraged (salary−wise and tie−in with routine field sampling for logistics and use of data) making it a very cost−effective project.

Technical Synthesis Panel (Discussion) Review

TSP Observations, Findings And Recommendations:

Phytoplankton Communities in the San Francisco Estuary: Monitoring and Management Using a Submersible Spectrofluorometer

The panel concluded that this was a well−developed proposal. The prospect of real−time and continuous data sampling described in this proposal is important. The panel also liked the combination of laboratory and field work.

However, the spatial and temporal analyses that are proposed were not well developed. The justification for developing the application of the instrument with respect to monitoring of harmful algal blooms was not overly strong. The panel also noted that the relevance to food web analysis was not developed (e.g., the effect of algal abundance and composition on zooplankton).

The proposed work would result in the development of a tool but not new scientific research. However, the tool that would be developed would have important applications in the CALFED monitoring program.

The PI has a good publication record.

This proposal is very cost effective, and could lead to important advances in phytoplankton monitoring.

Rating: above average

Technical Review #1

proposal title: Phytoplankton communities in the San Francisco Estuary: monitoring and management using a submersible spectrofluorometer

Review Form

Goals

Are the goals, objectives and hypotheses clearly stated and internally consistent? Is the idea timely and important?

Comments	**−The goals and hypotheses are clearly stated. Objectives are tied to testable hypotheses.**
Rating	**excellent**

Justification

Is the study justified relative to existing knowledge? Is a conceptual model clearly stated in the proposal and does it explain the underlying basis for the proposed work? Is the selection of research, pilot or demonstration project, or a full−scale implementation project justified?

Comments	**−This is a well justified proposal as it addresses topics directly germane to CALFED restoration activities. The topic of phytoplankton community structure is at the heart of ecosystem function and as such is of great interest to CALFED restoration efforts.**
Rating	**excellent**

Approach

Is the approach well designed and appropriate for meeting the objectives of the project? Is the approach feasible? Are results likely to add to the base of knowledge? Is the project likely to generate novel information, methodology, or approaches? Will the information ultimately be useful to decision makers?

Comments	**−The scientific approach is efficiently designed and organized into specific tasks. −Study directly addresses the Objectives of the proposal.**
Rating	**excellent**

Feasibility

Is the approach fully documented and technically feasible? What is the likelihood of success? Is the scale of the project consistent with the objectives and within the grasp of authors?

Comments	**−Given the research history and experience of the PIs, I believe the feasibility of performing the work is very high. −The specific tasks are well discussed and probabilities of success well documented by previous data collection. −Prior collaboration of the PIs enhances potential for success.**
Rating	**excellent**

Monitoring

If applicable, is monitoring appropriately designed (pre−post comparisons; treatment−control comparisons)? Are there plans to interpret monitoring data or otherwise develop information?

Comments	**−Project is appropriately designed and describes specific statistical analyses to be used to test results. −Discussion of data interpretation is a bit weak and there is no direct modeling component.**
Rating	**very good**

Products

Are products of value likely from the project? Are contributions to larger data management systems relevant and considered? Are interpretive (or interpretable) outcomes likely from the project?

Comments	

	–Products could be better defined. Saying only that this is research and will be reported in the literature is not enough. –Expectations are nebulous but potentially large. –I expected to see some sort of modeling of phytoplankton community structure under different restoration scenarios.
Rating	**very good**

Additional Comments

Comments

Capabilities

What is the track record of authors in terms of past performance? Is the project team qualified to efficiently and effectively implement the proposed project? Do they have available the infrastructure and other aspects of support necessary to accomplish the project?

Comments	**–The PIs are highly qualified in this field of research and has vast experience in phytoplankton ecology. –PIs have worked together before and have developed productive division of labor. –All have strong backgrounds in regional issues. –In addition the lead PI is well plugged into the whole EMP process and savvy to CALFED restoration activities.**
Rating	**excellent**

Budget

Is the budget reasonable and adequate for the work proposed?

Comments	**–The budget is reasonable and adequate for the project. –Highly leveraged, making the project a good value.**
Rating	**excellent**

Overall

Provide a brief explanation of your summary rating.

Comments	**–Well thought out design. –Practical approach. –Objectives related to testable hypotheses. –Potential wealth of new information. –Can be integrated into future models. –Uses pre–existing CALFED stations to build upon. –I give this proposal an excellent rating due to the high marks on all the above review qualifications and highly recommend it for funding.**
Rating	**excellent**

Technical Review #2

proposal title: Phytoplankton communities in the San Francisco Estuary: monitoring and management using a submersible spectrofluorometer

Review Form

Goals

Are the goals, objectives and hypotheses clearly stated and internally consistent? Is the idea timely and important?

Comments	**The goal of the proposed project is to improve the performance of Bay−Delta phytoplankton monitoring and to further understanding of spatial and temporal variation in phytoplankton biomass and composition. The three objectives of the project are to: (1) evaluate a new instrument for estimating algal biomass and composition; (2) investigate spatial variation in taxonomic composition along gradients of fertility and salinity within the estuary; and (3) investigate high frequency temporal variation at fixed stations. All three objetives are accompanied by clearly stated and quantitatively testable hypotheses.**
Rating	**excellent**

Justification

Is the study justified relative to existing knowledge? Is a conceptual model clearly stated in the proposal and does it explain the underlying basis for the proposed work? Is the selection of research, pilot or demonstration project, or a full−scale implementation project justified?

Comments	**The study could lead to substantial improvements in our knowledge of what factors control harmful algal blooms and other questions related to the composition as well as the abundance of phytoplankton in the estuary.**
Rating	

	excellent

Approach

Is the approach well designed and appropriate for meeting the objectives of the project? Is the approach feasible? Are results likely to add to the base of knowledge? Is the project likely to generate novel information, methodology, or approaches? Will the information ultimately be useful to decision makers?

Comments	**The study plan is well thought out and feasible. I see no 'tragic flaws.' The project could result in new information about spatial and temporal variation in algal abundance and composition and a powerful new monitoring tool.**
Rating	**excellent**

Feasibility

Is the approach fully documented and technically feasible? What is the likelihood of success? Is the scale of the project consistent with the objectives and within the grasp of authors?

Comments	**The likelihood for success is high.**
Rating	**excellent**

Monitoring

If applicable, is monitoring appropriately designed (pre−post comparisons; treatment−control comparisons)? Are there plans to interpret monitoring data or otherwise develop information?

Comments	**The lab and field studies are well designed for evaluating the new instrument's performance under a variety of environmental conditions. This evaluation includes parallel deployment of existing instrumentation. The statistical methods proposed for evaluating instrument performance and for investigating spatial and temporal variation are appropriate.**

Rating	**excellent**

Products

Are products of value likely from the project? Are contributions to larger data management systems relevant and considered? Are interpretive (or interpretable) outcomes likely from the project?

Comments	**Products would include reports, a peer-reviewed journal article and a scientific presentation. Data from the project would also be available on BDAT. Interpretable results could be expected.**
Rating	**excellent**

Additional Comments

Comments	**This is a win-win project from the standpoint of monitoring and research. The project would evaluate the efficacy of a new and potentially powerful long term monitoring tool and provide new information about what processes regulate the abundance and composition of sestonic algal biomass.**

Capabilities

What is the track record of authors in terms of past performance? Is the project team qualified to efficiently and effectively implement the proposed project? Do they have available the infrastructure and other aspects of support necessary to accomplish the project?

Comments	**The team is highly qualified and has access to excellent facilities and support staff to carry out this project successfully. To my knowledge, the PIs have an excellent track record.**
Rating	**excellent**

Budget

Is the budget reasonable and adequate for the work proposed?

Comments	**The project makes good use of existing field and other monitoring efforts, to keep costs reasonable and adequate.**
Rating	**excellent**

Overall

Provide a brief explanation of your summary rating.

Comments	**The proposed project is germane to Calfed Science support goals, it is timely, it could help fill important gaps in our knowledge about the structure and funciton of the estuary, it is well designed, cost effective and has a high probability of success given its clearly stated objectives, hypotheses, lab, field and statistical methods and highly qualified personnel.**
Rating	**excellent**

Technical Review #3

proposal title: Phytoplankton communities in the San Francisco Estuary: monitoring and management using a submersible spectrofluorometer

Review Form

Goals

Are the goals, objectives and hypotheses clearly stated and internally consistent? Is the idea timely and important?

Comments	**The primary goal (Objective 1) of this project is to acquire and test the usefulness of a submersible spectrofluorometer for monitoring the major taxonomic groups of phytoplankton in the dynamic region of the upper reaches of the San Francisco Estuary in the Sacramento–San Joaquin River delta region. This effort would involve an initial laboratory testing phase and subsequent field testing in both stationary deployments and station cast modes. Field data are intended both to test the instrument and to allow the PIs to assess the spatial and temporal distribution of phytoplankton groups in the region (Objectives 2 &3, respectively).** **The proposal to assess the usefulness of the bbe Fluoroprobe is certainly timely as ocean observing of our coastal waters expands and the application of new technologies to these efforts expands. The major goals of the project are consistent, although the PIs have not fully convinced me that the field sampling program is sufficient to fully assess the spatial and temporal distributions in any more than a preliminary manner. This results primarily from long lists of deployment opportunities that are not adequately integrated in proposal. In addition, the authors frequently mention the potential application of the Fluoroprobe in assessing HABs although no mention is made of the instruments ability to distinguish dinoflagellates.**

Rating	**very good**

Justification

Is the study justified relative to existing knowledge? Is a conceptual model clearly stated in the proposal and does it explain the underlying basis for the proposed work? Is the selection of research, pilot or demonstration project, or a full−scale implementation project justified?

Comments	**The PIs have clearly identified the scientific and management background in which the proposed project would take place and the potential usefulness of the spectrofluorometer. The preliminary data transect provides strong evidence for the type of information that could be gained from the project. As detailed above, the strength of the proposed work is in its 'proof of concept' for the use of such an instrument in estuarine monitoring and the testing of different methods of deployment, not in the assessment of temporal and spatial variability that is too strongly stated in objectives 2 &3.**
Rating	**excellent**

Approach

Is the approach well designed and appropriate for meeting the objectives of the project? Is the approach feasible? Are results likely to add to the base of knowledge? Is the project likely to generate novel information, methodology, or approaches? Will the information ultimately be useful to decision makers?

Comments	**The project proposes to determine the usefulness of a new instrument to assess the distribution of phytoplankton taxonomic groups in estuaries. The PIs make a strong case for what this might be important, although they do not really address how this information would ultimately be brought into the decision making process. There is significant budget applied to phytoplankton**

	enumeration; however, it is not clear how these data will be interpreted relative to the broader classes measured with the spectrofluorometer.
Rating	**very good**

Feasibility

Is the approach fully documented and technically feasible? What is the likelihood of success? Is the scale of the project consistent with the objectives and within the grasp of authors?

Comments	**Yes, the approach seems feasible. Detail as to how mixed cultures and varying field samples will be compared and what might constitute 'adequate' performance by the Fluoroprobe is not addressed in the proposal.**
Rating	**very good**

Monitoring

If applicable, is monitoring appropriately designed (pre−post comparisons; treatment−control comparisons)? Are there plans to interpret monitoring data or otherwise develop information?

Comments	**The PIs talk about submitting Fluoroprobe data to common databases, but the basic approach is developmental rather than operational monitoring. This is inadequately distinguished in the proposal.**
Rating	**good**

Products

Are products of value likely from the project? Are contributions to larger data management systems relevant and considered? Are interpretive (or interpretable) outcomes likely from the project?

Comments	

	The core product from this research will be the final report which will assess the usefulness and value of the Fluoroprobe for operational monitoring in the future.
Rating	**very good**

Additional Comments

Comments	**None.**

Capabilities

What is the track record of authors in terms of past performance? Is the project team qualified to efficiently and effectively implement the proposed project? Do they have available the infrastructure and other aspects of support necessary to accomplish the project?

Comments	**The two senior PIs have proven track records in phytoplankton ecology and the remaining team members have expertise in instrument deployment and maintenance. The inclusion of an expert on spectrofluorometry (and it's application under field conditions) would strengthen the proposal but I expect that they will gain some expertise from the manufacturer.**
Rating	**very good**

Budget

Is the budget reasonable and adequate for the work proposed?

Comments	**The budget is very reasonable for the level of activity associated with the proposed work. The only expense that raises an eyebrow is the cost of the microscopic enumeration (primarily because of the lack of explanation as to how they will actually use the data in comparison with the Fluoroprobe data). Non-CALFED salary support for the PI is a major commitment from the CDWR and reduces the cost considerably. Note: Whether in the programming or as a**

	result of data entry, the % fringe costs are incorrect; e.g. 0.36% versus 36%.
Rating	**excellent**

Overall

Provide a brief explanation of your summary rating.

Comments	**For relatively low cost, this project will provide an important assessment of the usefulness of in situ spectrofluorometry in assessing phytoplankton in the upper San Francisco Estuary (presumably this will apply to other similar environments). The PIs make a good case for why this would be useful and the specific applicability to management needs. My only concern is that Objectives 2 &3 are beyond the scope of this 'proof of concept' effort. Even so, I believe that this effort is well designed and cost effective and recommend support.**
Rating	**very good**